

## 2. DATA USER'S GUIDE

### 2.1. D2 DATA (MONTHLY, 280 KM EQUAL-AREA GRID)

#### 2.1.1. ARCHIVE TAPE LAYOUT

Each D2 archive tape has 5 header files, followed by a variable number of data files depending on how many months are archived (usually one year per tape). Data are arranged chronologically. Nine files are written for each month, representing the hour-monthly mean for each 3-hour time interval (from UTC 00 to UTC 21) followed by the overall monthly mean. Thus for one year, there are  $12 \times 9 = 108$  data files on the tape.

**Table 2.1.1. D2 Archive Tape Layout.**

FILE	CONTENTS	FORMAT	RECORD LENGTH (BYTES)
1	README file	ASCII	80
2	Table of Contents	ASCII	80
3	Read Software	ASCII	80
4	Ancillary Data Table	ASCII	80
5	Adjustment Coefficients	ASCII	80
6-end	D2 Cloud Data	Binary	13000

***Note:** The GPC produces archive tapes using IBM standard label format which means that there are label records written before and after each file on the tape. On IBM systems, these labels provide information to the operating system about the name and format of the file and will appear transparent to the user. On non-IBM systems these label records will appear as extra short files surrounding each file listed above and should be skipped by the user. The presence or absence of these files depends on which archive supplies tape copies to the user, as they may either provide an exact copy (labels present) or a modified copy (labels absent).*

#### 2.1.2. HEADER FILE CONTENTS

**File 1** is the **README** file that contains ASCII text providing descriptive information about the tape format and contents, similar to what is written in this section. The first line of text (80 bytes) gives the ISCCP tape designator code that identifies the contents and version (Table 2.5.12).

**File 2** is the **Table of Contents** file that lists the date and spatial coverage of each data file on the tape in ASCII columns defined in Table 2.1.2. See Table 2.5.1 for Satellite ID code definitions and Table 2.5.2 for Satellite position definitions.

**Table 2.1.2. Table of Contents Layout.**

COLUMN	DESCRIPTION
1	File number
2	Year (83 - 99)
3	Month (1 - 12)
4	Time UTC (00, 03, 06...21)
5	Fraction (%) of good data
6	Fraction (%) of empty map grid cells
7	Satellite ID for Western Pacific/Australia position
8	Satellite ID for Europe/Africa position
9	Satellite ID for Eastern Pacific position
10	Satellite ID for North/South American position
11	Satellite ID for Indian Ocean/Asia position
12	Satellite ID for Afternoon polar orbit
13	Satellite ID for Morning polar orbit

**File 3** contains a sample **FORTRAN program** and subroutines for reading, decoding and using D2 data as follows:

Program SAMPLE:	Example of how to use these subroutines
Subroutine D2OPEN:	Open a D2 file and initialize
Subroutine D2READ:	Unpack D2 data for one latitude band into integer count values
Subroutine D2REC:	Used by D2READ to unpack a logical record
Subroutine D2PHYS:	Convert integer counts in latitude band to physical values
Subroutine RDANC:	Read ancillary data file
Subroutine PRINTI:	Print parameter count values for one grid box
Subroutine PRINTR:	Print physical values for one grid box
Subroutine CENTER:	Calculate center longitude/latitude of map grid cell
Subroutine CLDHGT:	Calculate cloud top height in meters
Subroutine EQ2SQ:	Convert equal-area map to equal-angle map
BLOCK DATA:	Conversion tables and equal-area grid information

The programs should work as written on most UNIX systems. For DOS, MacIntosh or VAX systems, the OPEN statement in subroutine D2OPEN may need to be modified.

**File 4** contains the **Ancillary Data Table** that lists characteristics of each map grid cell (see Section 3.1.1) in ASCII columns defined in Table 2.1.3.

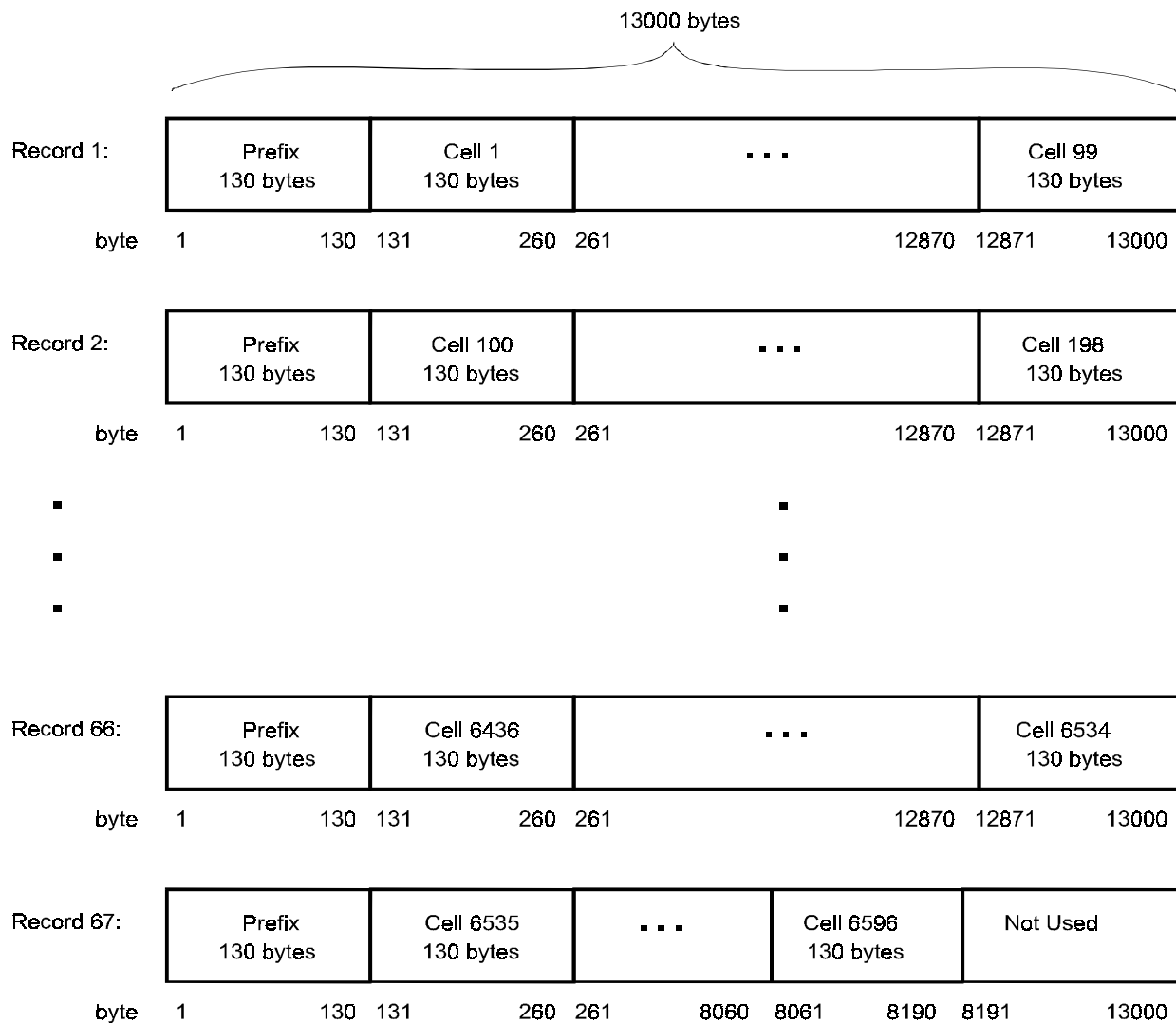
**Table 2.1.3. Ancillary Data Table Layout.**

COLUMN	DESCRIPTION
1	ISCCP map grid cell number (1 - 6596)
2	Equal-area latitude index (south-to-north = 1 - 72)
3	Equal-area longitude index (west-to-east, variable up to 144)
4	Western-most equal-angle longitude index (1 - 144)
5	Eastern-most equal-angle longitude index (1 - 144)
6	Map grid cell center latitude in degrees
7	Map grid cell center longitude in degrees
8	Map grid cell area (km <sup>2</sup> )
9	Land cover fraction (%)
10	Mean topographic altitude (m)
11	Vegetation type (see Table 2.5.3)

**File 5** contains the **Adjustment Coefficients** applied to the data for each month (see Section 3.1.7) listed as ASCII text.

### 2.1.3. DATA FILE CONTENTS

Each D2 data file (Figure 2.1) reports 130 variables for each of the 6596 map grid cells in the ISCCP Equal-Area map grid (see Section 3.1.1). Each variable is reported in a single byte representing a coded value from 0-255 (see Sections 2.4 and 3.1.2), so there are 130 bytes in each map grid cell. Each physical record is 13000 bytes in length, consisting of a 130 byte record prefix, followed by up to 99 map grid cells of 130 bytes each. All map grid cells and variables are present, even when data are missing. Missing data are indicated by code values of 255. Contents of the prefix are given in Table 2.1.4 and of each map grid cell in Table 2.1.5.



**Figure 2.1.** D2 Data File Layout.

**Table 2.1.4. D2 Data Record Prefix Layout.**

BYTE No.	DESCRIPTION
1	Record number in file (1 - 67)
2	File number on archive tape (5 - 112)
3	Year (83 - 99)
4	Month (1 - 12)
5	<Not used = 255>
6	Time UTC (00, 03, 06, ... 21, 255) where 255 = ALL TIMES
7	Beginning equal-area latitude index in record
8	Beginning equal-area longitude index in record
9	Ending equal-area latitude index in record
10	Ending equal-area longitude index in record
11 - 130	Filled with 255

**Table 2.1.5. D2 Data Map Grid Cell Layout.** (see Table 2.5.4 for definition of abbreviations and units, Table 2.5.5 for definitions of radiance threshold categories and Table 2.5.7 for cloud type definitions). *Note: Variables labeled with "d" are defined only for local daytime and are undefined at night (undefined = 255).*

BYTE No.	DESCRIPTION
MAP GRID CELL IDENTIFICATION	
1	Latitude index (equal-area and equal-angle)
2	Longitude index (equal-area)
3	Western-most longitude index (equal-angle)
4	Eastern-most longitude index (equal-angle)
5	Land/water/coast code (see Table 2.5.6)
6	Number of observations
7	Number of daytime observations
CLOUD AMOUNTS (CA)	
8	Mean cloud amount
9	Mean IR-marginal cloud amount
10	Frequency of mean cloud amount = 0-10%
11	Frequency of mean cloud amount = 10-20%
12	Frequency of mean cloud amount = 20-30%
13	Frequency of mean cloud amount = 30-40%
14	Frequency of mean cloud amount = 40-50%
15	Frequency of mean cloud amount = 50-60%
16	Frequency of mean cloud amount = 60-70%
17	Frequency of mean cloud amount = 70-80%
18	Frequency of mean cloud amount = 80-90%
19	Frequency of mean cloud amount = 90-100%

Continued.

**Table 2.1.5.** (continued).

BYTE No.	DESCRIPTION
MEAN CLOUD TOP PRESSURE (PC)	
20	Mean cloud top pressure
21	Standard deviation of spatial mean over time
22	Time mean of standard deviation over space
MEAN CLOUD TOP TEMPERATURE (TC)	
23	Cloud temperature
24	Standard deviation of spatial mean over time
25	Time mean of standard deviation over space
MEAN CLOUD OPTICAL THICKNESS (TAU)	
26	Mean cloud optical thickness
27	Standard deviation of spatial mean over time
28	Time mean of standard deviation over space
MEAN CLOUD WATER PATH (WP)	
29	Mean cloud water path
30	Standard deviation of spatial mean over time
31	Time mean of standard deviation over space
IR CLOUD TYPES (see Table 2.5.7)	
32	Mean CA for low-level clouds
33	Mean PC for low-level clouds
34	Mean TC for low-level clouds
35	Mean CA for middle-level clouds
36	Mean PC for middle-level clouds
37	Mean TC for middle-level clouds
38	Mean CA for high-level clouds
39	Mean PC for high-level clouds
40	Mean TC for high-level clouds

Continued.

**Table 2.1.5.** (continued).

BYTE No.	DESCRIPTION
VIS/IR/NIR LOW-LEVEL CLOUD TYPES (see Table 2.5.7)	
41d	Mean CA for cloud type 1 = Cumulus, liquid
42d	Mean PC for cloud type 1
43d	Mean TC for cloud type 1
44d	Mean TAU for cloud type 1
45d	Mean WP for cloud type 1
46d	Mean CA for cloud type 2 = Stratocumulus, liquid
47d	Mean PC for cloud type 2
48d	Mean TC for cloud type 2
49d	Mean TAU for cloud type 2
50d	Mean WP for cloud type 2
51d	Mean CA for cloud type 3 = Stratus, liquid
52d	Mean PC for cloud type 3
53d	Mean TC for cloud type 3
54d	Mean TAU for cloud type 3
55d	Mean WP for cloud type 3
56d	Mean CA for cloud type 4 = Cumulus, ice
57d	Mean PC for cloud type 4
58d	Mean TC for cloud type 4
59d	Mean TAU for cloud type 4
60d	Mean WP for cloud type 4
61d	Mean CA for cloud type 5 = Stratocumulus, ice
62d	Mean PC for cloud type 5
63d	Mean TC for cloud type 5
64d	Mean TAU for cloud type 5
65d	Mean WP for cloud type 5
66d	Mean CA for cloud type 6 = Stratus, ice
67d	Mean PC for cloud type 6
68d	Mean TC for cloud type 6
69d	Mean TAU for cloud type 6
70d	Mean WP for cloud type 6

Continued.

**Table 2.1.5.** (continued).

BYTE No.	DESCRIPTION
VIS/IR/NIR MIDDLE-LEVEL CLOUD TYPES (see Table 2.5.7)	
71d	Mean CA for cloud type 7 = Altocumulus, liquid
72d	Mean PC for cloud type 7
73d	Mean TC for cloud type 7
74d	Mean TAU for cloud type 7
75d	Mean WP for cloud type 7
76d	Mean CA for cloud type 8 = Altostratus, liquid
77d	Mean PC for cloud type 8
78d	Mean TC for cloud type 8
79d	Mean TAU for cloud type 8
80d	Mean WP for cloud type 8
81d	Mean CA for cloud type 9 = Nimbostratus, liquid
82d	Mean PC for cloud type 9
83d	Mean TC for cloud type 9
84d	Mean TAU for cloud type 9
85d	Mean WP for cloud type 9
86d	Mean CA for cloud type 10 = Altocumulus, ice
87d	Mean PC for cloud type 10
88d	Mean TC for cloud type 10
89d	Mean TAU for cloud type 10
90d	Mean WP for cloud type 10
91d	Mean CA for cloud type 11 = Altostratus, ice
92d	Mean PC for cloud type 11
93d	Mean TC for cloud type 11
94d	Mean TAU for cloud type 11
95d	Mean WP for cloud type 11
96d	Mean CA for cloud type 12 = Nimbostratus, ice
97d	Mean PC for cloud type 12
98d	Mean TC for cloud type 12
99d	Mean TAU for cloud type 12
100d	Mean WP for cloud type 12

Continued.



**Table 2.1.5.** (continued).

BYTE No.	DESCRIPTION
VIS/IR/NIR HIGH-LEVEL CLOUD TYPES (see Table 2.5.7)	
101d	Mean CA for cloud type 13 = Cirrus
102d	Mean PC for cloud type 13
103d	Mean TC for cloud type 13
104d	Mean TAU for cloud type 13
105d	Mean WP for cloud type 13
106d	Mean CA for cloud type 14 = Cirrostratus
107d	Mean PC for cloud type 14
108d	Mean TC for cloud type 14
109d	Mean TAU for cloud type 14
110d	Mean WP for cloud type 14
111d	Mean CA for cloud type 15 = Deep convective
112d	Mean PC for cloud type 15
113d	Mean TC for cloud type 15
114d	Mean TAU for cloud type 15
115d	Mean WP for cloud type 15
MEAN SURFACE SKIN TEMPERATURE (TS)	
116	Mean TS from clear sky composite
117	Time mean of standard deviation over space
MEAN SURFACE VISIBLE REFLECTANCE (RS)	
118d	Mean RS from clear sky composite
ICE/SNOW COVER	
119	Mean ice/snow cover
TOVS ATMOSPHERIC INFORMATION	
120	Mean Surface pressure (PS)
121	Mean Near-surface air temperature (TSA)
122	Mean Temperature at 740 mb (T)
123	Mean Temperature at 500 mb (T)
124	Mean Temperature at 375 mb (T)
125	Mean Tropopause pressure (PT)
126	Mean Tropopause temperature (TT)
127	Mean Stratosphere temperature at 50 mb (T)
128	Mean Precipitable water for 1000-680 mb (PW)
129	Mean Precipitable water for 680-310 mb (PW)
130	Mean Ozone column abundance (O3)

**Note:** In addition, cloud top heights in meters are calculated in the D2READ program provided.